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RE: Serial No.: 10/727,709
Attorney Docket No.: BAO 39
LUCT-125888

DATE: February 27, 2006

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DOCKET NO. BAO 39 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: Zhenan Bao

Serial No.: 10/727,709

Filed: December 4, 2003

For: ORGANIC FIELD EFFECT TRANSISTORS WITH ACTIVE CHANNELS FORMED OF DENSIFIED LAYERS

Grp./A.U.: 2814

Examiner: Wai Sing Louie

Mail Stop Appeal Brief-Patents

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ATTENTION: Board of Patent Appeals and Interferences

Sirs:

APPEAL BRIEF UNDER 37 C.F.R. §41.37

This is an appeal from a Final Rejection dated November 29, 2005, of Claims 1-11. The Appellant submits this Brief with the statutory fee of large entity as set forth in 37 C.F.R.§41.20(b)(2), and hereby authorize the Commissioner to charge any additional fees connected with this communication or credit any overpayment to Deposit Account No. 08-2395.

This Brief contains these items under the following headings, and in the order set forth below in accordance with 37 C.F.R. §41.37(c)(1):

I. REAL PARTY IN INTEREST

II. RELATED APPEALS AND INTERFERENCES

III. STATUS OF CLAIMS

IV. STATUS OF AMENDMENTS

V. SUMMARY OF CLAIMED SUBJECT MATTER

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

VII. APPELLANTS' ARGUMENTS

VIII. APPENDIX A - CLAIMS

IX. APPENDIX B - EVIDENCE

X. RELATED PROCEEDINGS APPENDIX

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I. REAL PARTY IN INTEREST

The real party in interest in this appeal is the Assignee, Lucent Technologies Inc.

II. RELATED APPEALS AND INTERFERENCES

No other appeals or interferences will directly affect, be directly affected by, or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1-11 are pending in this application and have been rejected under 35 U.S.C. §102. Each of the pending claims and are being appealed.

IV. STATUS OF THE AMENDMENTS

The present Application was filed on December 4, 2003.

The Appellant submitted Claims 1-20 in the application, and in a prior response to a restriction requirement, elected to prosecute Claims 1-11. The Examiner issued a rejection on August 4, 2005. The Appellant filed a Request for Reconsideration on September 14, 2005. The Examiner issued a Final rejection on November 29, 2005. No amendments to the claims have been made subsequent to the Examiner's Final Rejection.

The Appellant filed a Notice of Appeal and Pre-Appeal Request for Review on December 16, 2005. The Panel Decision, mailed January 31, 2006, indicated that the application remained under appeal because there is at least one actual issue for appeal.

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V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention is directed, in general, to manufacturing OFETS having high mobility channels. The apparatus 100 set forth in Claim 1 comprises a substrate 105 having a surface 110 (Figure 1 shown in Illustration 1 below; paragraph [0016]). An organic field-effect transistor 115 is located adjacent the surface 110 of the substrate 105, the transistor 115 comprising a gate 120, a channel 125, a source electrode 130, and a drain electrode 135 (paragraph [0016]). The channel 125 comprises a densified layer of organic molecules with conjugated multiple bonds 150, the axes 155 of the organic molecules being oriented substantially normal to the surface 110 (paragraph [0017]).

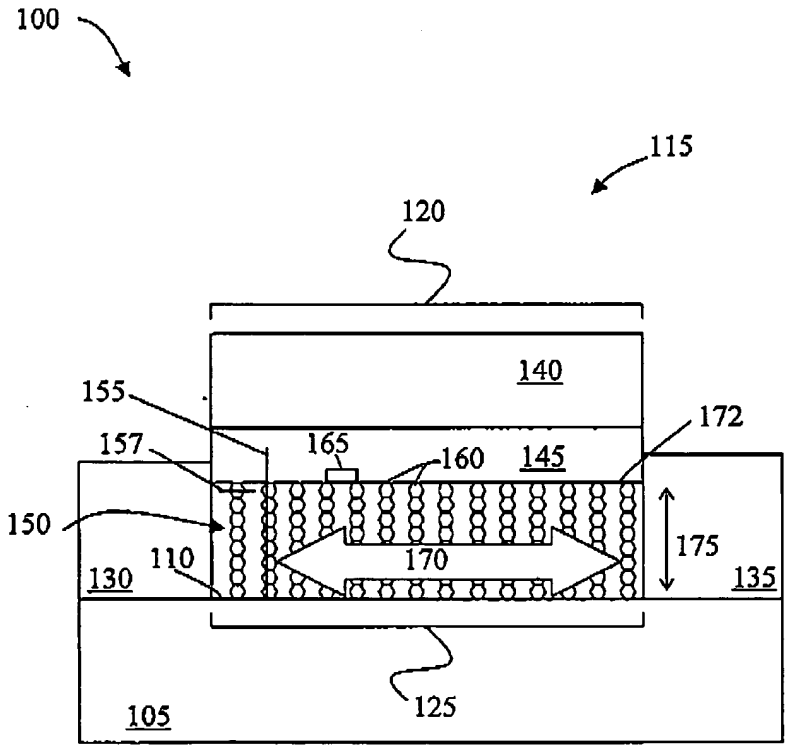

FIGURE 1

Illustration 1

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As explained in the Application (paragraph 0018]), the layer of organic molecules 150 is referred to as densified if the layer 150 is physically strained parallel to the substrate-surface 110 on which the layer 150 is formed. In a densified layer 150, the strain is a force of expansion that results from an over-density of organic molecules. A densified layer 150 has a strain, because the molecular over-density has not relaxed to a lower value that would be found in a bulk layer of the same composition. The densified layer 150 is too thin for complete relaxation of the strain, which is caused by the over-density of molecules at the substrate-surface. One way to form a densified layer of molecules 150 involves depositing the molecules on a stretched substrate 105 and then allowing the substrate 105 to unstretch. Such a process can produce an over-density of molecules that would not have occurred if the layer had been formed directly on an unstretched substrate.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The first issue presented for consideration in this appeal is whether Claim 1, as rejected by the Examiner, is anticipated in accordance with 35 U.S.C. §102(e) by U.S. Patent No. 6,777,529 to Ong *et al.* ("Ong").

The second issue presented for consideration in this appeal is whether Claims 2-5 and 8-11, as rejected by the Examiner, are patentably nonobvious in accordance with 35 U.S.C. §103(a) over Ong.

The third issue presented for consideration in this appeal is whether Claims 6-7, as rejected by the Examiner, are patentably nonobvious in accordance with 35 U.S.C. §103(a) over Ong in view of U.S. Patent No. 6,713,389 to Speakman ("Speakman").

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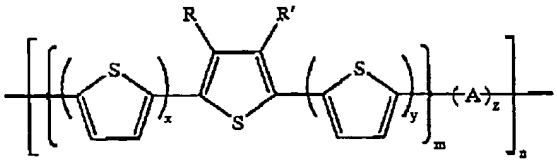
VII. APPELLANTS' ARGUMENT

For the reasons set forth below, the invention recited in Claims 1-11 are not anticipated or made obvious by the art applied by the Examiner.

A. Ong

Ong is directed to organic microelectronic devices, and more specifically, to the use of a class of polythiophenes as active materials in thin film transistors. (Column 1, Lines 18-21). Ong's polythiophenes have the general formula:



wherein R and R' are side chains; A is a divalent linkage; x and y represent the number of unsubstituted thienylene units or segments; z is 0 or 1, and wherein the sum of x and y is greater than zero; m represents the number of segments; and n represents the degree of polymerization (Abstract). Ong's polythiophenes can be the channel materials in thin film (TFT) configurations (Fig.1, Column 13, Lines 55-58; Ong's Fig.1 is presented in illustration 2):

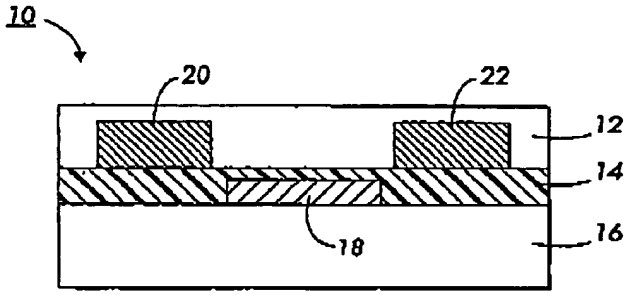


Fig.1

Illustration 2

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Ong's TFT 10 comprises a substrate 16 in contact therewith a metal contact 18 (gate electrode) and a layer of an insulating dielectric layer 14 contained thereon or on top of which two metal contacts, 20 and 22 (source and drain electrodes) are deposited. Over and between the metal contacts 20 and 22 is the polythiophene semiconductor layer 12. (Column 13, Lines 59-67). Ong indicates that test polythiophene layers are deposited by spin coating under ambient conditions onto a glass substrate having a silicon nitride gate dielectric (Column 16, Lines 2-20). Ong also states that for structurally flexible devices, plastic substrate, such as for example polyester, polycarbonate, polyimide sheets, and the like, may be preferred (Column 14, Lines 35-37).

B. The Examiner has not established anticipation of Claim 1.

As applied by the Examiner, Ong does not disclose each and every element of the claimed invention and as such, is not anticipating reference of Claim 1. In particular, the Examiner has not shown how Ong teaches a channel comprising a densified layer of organic molecules, as recited in Claim 1.

In fact, the Examiner acknowledges that Ong does not specifically state that the channel comprises a densified layer of organic molecules (Examiner's Detailed Action November 29, 2005, Page 2 Lines 20 to 21). The Examiner, however, then goes on to assert that,

> [S]ince Zhang et al. [sic] disclose the claimed structure and the same organic compound, polythiophene as disclosed in the instance specification, it is clear that such a material results in the densified layer of organic molecules . . . and is thus an inherent feature of the claimed semiconductor device. (Examiner's Detailed Action of November 29, 2005, Page 2 Line 23 to Page 3 Line 3).

The Examiner further states,

> Ong et al. disclose the polythiophene channel layer 12 has an average molecular weight of 2,000 to 100,000 (col. 4, lines 15-46). This is a densified organic channel layer. (Examiner's Detailed Action of November 29, 2005, Page 5, Lines 5-7)

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The Appellant does not agree that Ong's polythiophene semiconductor layer would inherently be a densified layer of organic molecules, as implied by the Examiner in the above-cited portion of the Office Action.

Concerning the requirements of rejections based on inherency, the MPEP ¶ 2112 IV states that the Examiner must provide rationale or evidence tending to show inherency. Citing *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993), the MPEP ¶ 2112 IV further states,

> The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. (emphasis in original)

The MPEP ¶ 2112 IV goes on to quote *Ex parte Levy*:

> "In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original)

As pointed out to the Examiner (response mailed September 14, 2005), the cited portions of Ong do not discuss the density of Ong's polythiophene semiconductor layer, or state that the density organic molecules on a substrate surface has been increased. Indeed, the cited portions of Ong do not provide any suggestion of a process that would have densified the molecules in the layer. Moreover, the Examiner has presented no factual or technical reasons why a channel layer made of polythiophene molecules having an average molecular weigh of 2,000 to 100,000 would inherently be a densified layer as in Claim 1.

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The Appellant submits that the Examiner has presented no evidence that a channel comprising a densified layer of organic molecules is an inherent characteristic that necessarily flows from the teachings of Ong. For example, the Examiner has not shown that Ong teaches a semiconductor layer that is physically strained to the substrate surface, or that Ong has disclosed any steps that would inherently result in a densified layer of organic molecules. As pointed out by the Federal Circuit in *In re Rijckaert*, the fact that a certain characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that characteristic.

For these reasons, the Appellant respectfully requests that the Board remove the rejection of Claim 1 under 35 U.S.C. §102(e).

C. The Examiner has not established a *prima facie* case of obviousness of Claims 2-11.

As discussed in section B above, the cited sections of Ong do not teach or suggest a densified layer of organic molecules as recited by Claim 1. The Appellant therefore respectfully maintains that because Ong fails to establish a *prima facie* case of obviousness of Claim 1, this reference also cannot establish a *prima facie* case of obviousness of dependent Claims 2-5 and 8-11, which include all the elements of the independent claim.

Additionally, the Examiner has not cited Speckman in the rejection of Claim 1 and does not use this reference to support a teaching or suggestion of a densified layer of organic molecules. Therefore, the combination of Ong in view of Speakman as applied by the Examiner also fails to establish a *prima facie* case of obviousness of dependent Claims 6-7.

The Applicant therefore respectfully requests the Board to remove the rejection of Claims 2-11.

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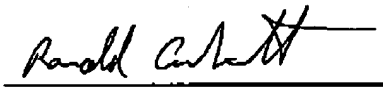
D. Conclusion

For the reasons set forth above, the Claims on appeal are not anticipated by Ong and are patentably nonobvious over Ong or Ong in view of Speakman. Accordingly, the Appellant respectfully requests that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of all of the Appellant's pending claims.

The Commissioner is hereby authorized to charge the $500 Appeal Brief fee and any fees, credits or overpayments to Deposit Account 08-2395.

Respectfully submitted,

Hitt Gaines, P.C.



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VIII. APPENDIX A - CLAIMS

1. An apparatus, comprising,

a substrate having a surface;

an organic field-effect transistor located adjacent said surface of said substrate, said transistor comprising a gate, a channel, a source electrode, and a drain electrode; and

wherein said channel comprises a densified layer of organic molecules with conjugated multiple bonds, axes of said organic molecules being oriented substantially normal to said surface.

2. The apparatus of claim 1, wherein said densified layer of organic molecules has a surface density of at least about 7 molecules/nm^2.

3. The apparatus of claim 1, wherein said densified layer is defined by said organic molecules having an average separation of less than about 3.8 Angstroms.

4. The apparatus of claim 1, wherein said densified layer is defined by said organic molecules having a uniform orientation that provides a polarization ratio of greater than about 1.

5. The apparatus of claim 4, wherein said uniform orientation is substantially coincident in a direction of current flow between said source and drain electrodes.

6. The apparatus of claim 1, wherein said substrate comprises an elastomer, wherein said

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elastomer has a glass transition temperature (T_G) of less than about 30°C.

7. The apparatus of claim 6, wherein said elastomer is an alkyl-substituted polysiloxane.

8. The apparatus as recited in Claim 6, wherein said organic molecules have substantially coplanar aromatic groups.

9. The apparatus as recited in Claim 1, wherein said organic molecules are linear organic molecules.

10. The apparatus as recited in Claim 1, wherein said organic molecules are covalently bonded to said surface.

11. The apparatus as recited in Claim 1, wherein said channel has a field effect mobility of at least about 10^{-4} cm^2 V^{-1} s^{-1}.

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IX. APPENDIX B - EVIDENCE

NONE

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X. RELATED PROCEEDINGS APPENDIX

NONE

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